


**Data**

Crankshaft Standard size & undersizes	Crankshaft bearing journal dia.	Width of journal at thrust bearing	Conrod bearing journal dia.	Conrod bearing journal width
Standard size	<u>59.96</u> 59.95	<u>29.00</u> 29.02	<u>47.96</u> 47.95	<u>28.00</u> 28.08
1st Undersize	<u>59.71</u> 59.70	to 29.60	<u>47.71</u> 47.70	to 28.30
2nd Undersize	<u>59.46</u> 59.45		<u>47.46</u> 47.45	
3rd Undersize	<u>59.21</u> 59.20		<u>47.21</u> 47.20	
4th Undersize	<u>58.96</u> 58.95		<u>46.96</u> 46.95	
Crankshaft journal dia. for mounting compensating weight			0.030	
Permissible deviation of crankshaft journal prior to mounting compensating weight			from cyl. shape	0.005
			from true <sup>1)</sup>	0.030
Permissible deviation of crank pins and crankshaft bearing journals from true			0.0025	
Permissible deviation of crank pin cyl. line from parallel			0.010	
Permissible deviation of running surfaces of fitted bearing from parallel <sup>1)</sup>			0.020	
Permissible deviation of running surface of rear radial sealing ring from concentric true <sup>1)</sup>			0.015	
Permissible deviation of flywheel flange from axial true <sup>1)</sup>			0.010	
Permissible deviation of crankshaft bearing journal from concentric true <sup>1)</sup>			journal II, VI	0.070
			journal III, IV, V	0.100
Fillets on crankshafts and crank pins			2.5 to 3	

Scleroscope hardness of crankshaft bearing journals and crank pins	when new	74–84
	boundary value	60 <sup>2)</sup>
Permissible unbalance of crankshaft	15 cmg	

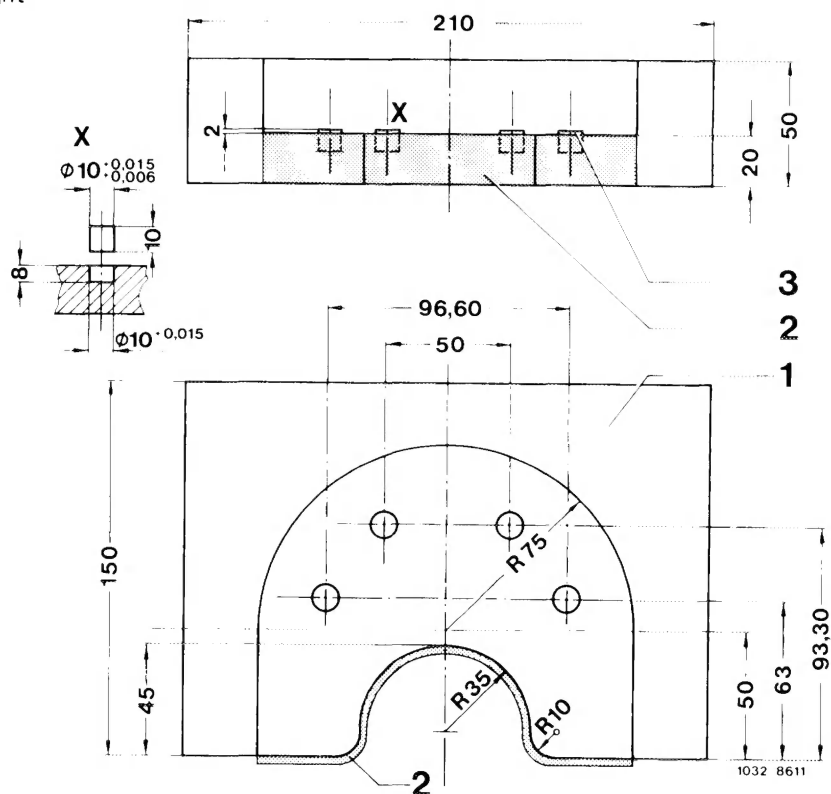
- 1) When mounting crankshaft on outer crankshaft bearing journal I and VII after one full turn.  
2) Boundary value should be available at min. 2/3 of journal circumference.

### Special tool

Impact hardness tester		000 589 20 21 00
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### Self-made tool

Rivet support for riveting counterweight to crankshaft.



## Note

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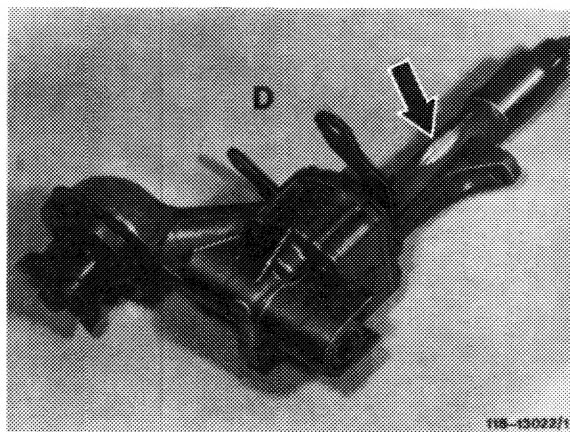
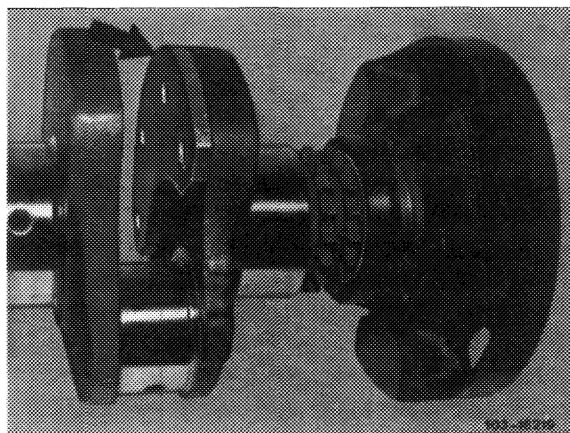
Since December 1978, the crankshaft of engine 110 is provided with an additional weight. Remove additional weight when machining first crank pin.

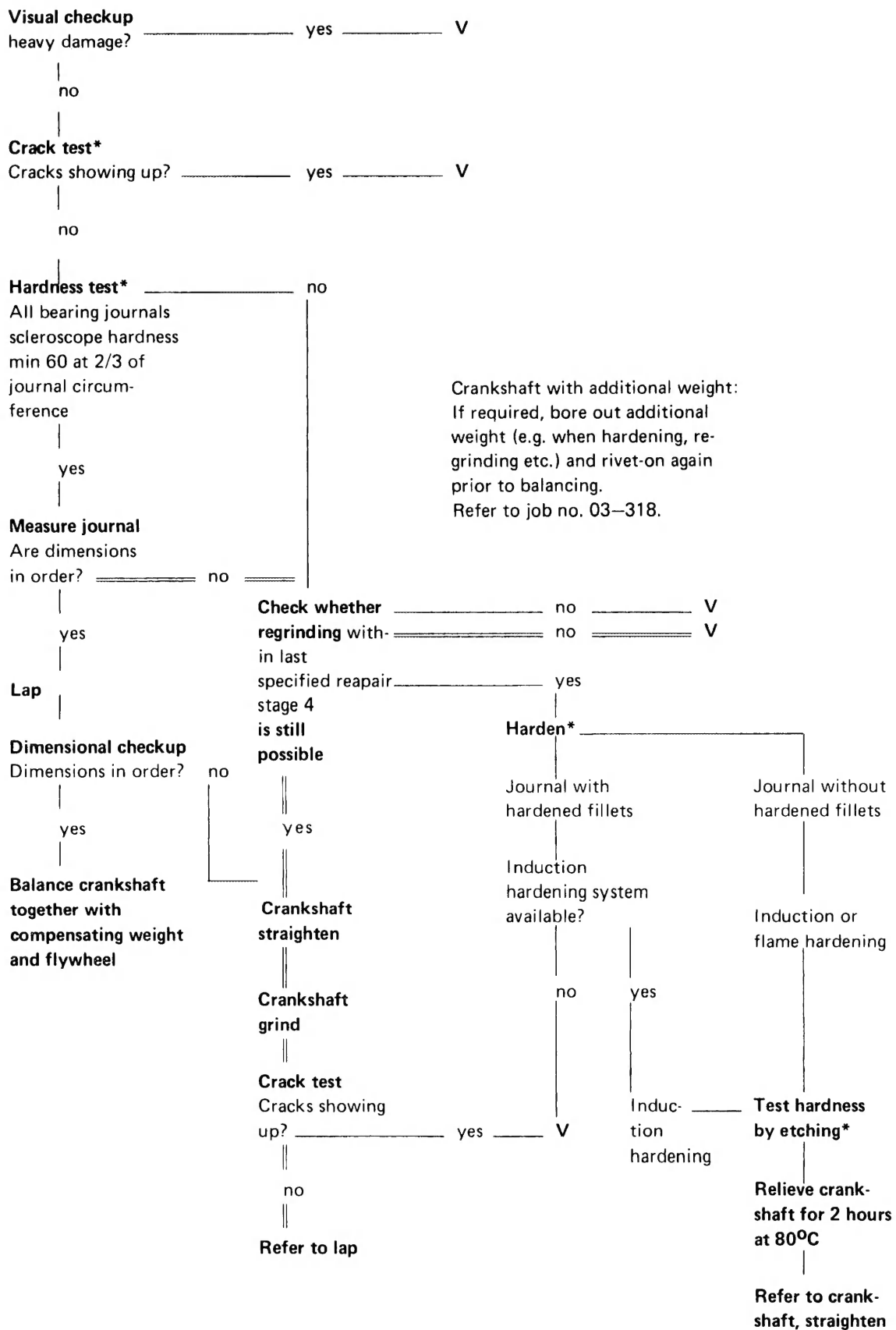
After machining crank pin, rivet additional weight on again. Then check crankshaft for runout, and balance together with flywheel and balancing disc, also when re-using the old additional weight.

The crankshaft with riveted-on additional weight may be used only together with a modified oil pump which is provided with a recess (arrow) on housing shaft.

When checking and reconditioning crankshafts, proceed in sequence of the following diagram and pertinent explanations.

For grinding crank pins, a difference of only one repair stage per crankshaft is permitted.





## Explanations concerning diagram

### Crack test

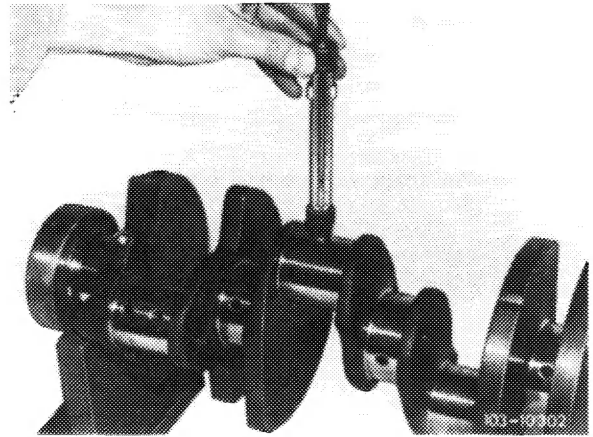
Clean crankshaft. Bearing journals should be free of oil and grease. Magnetize crankshaft and apply fluorescent powder (flux). A color penetration method (insertion in bath or with spray can) can also be applied.

Aids: paint or fluorescent powder,  
cleaning agent,  
developer.

### Hardness test

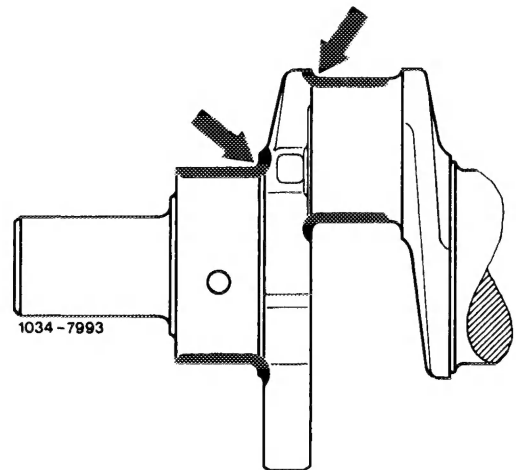
Test hardness with impact hardness tester (scleroscope hardness).

Scleroscope hardness of 60 should be available at 2/3 of journal circumference.

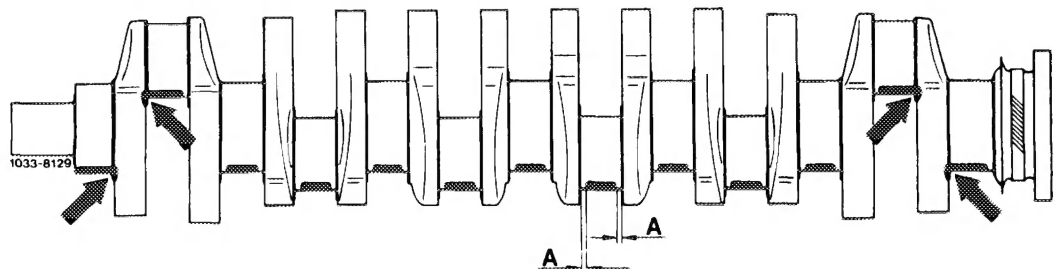


### Hardening

Journals without hardened fillets can be hardened inductively or by flame hardening. Journals with hardened fillets (arrows) should be inductance-hardened on principle. If this is not possible, scrap crankshaft.



When hardening journals without hardened fillets, maintain distance A between runout of hardened surface and fillet (4–5 mm).



### Checking hardening procedure

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For a good hardening job, test adjustment of hardening plant by metallographic grinding tests.

These tests can be made by testing scrapped crankshafts.

Check hardening by etching surface of journal with a 2% alcoholic nitric acid ( $\text{HNO}_3$ ).

No dark spots should show up at surface of journal.

Non-hardened fillets will become dark.

The hardened fillets, on the other hand, should be as bright as surface of journal.

For comparison, perform an etching job on a metallographically controlled journal.

Then, carefully wash off nitric acid by means of alcohol.

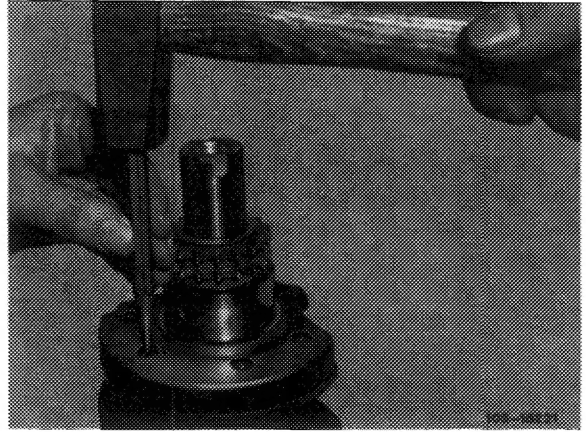
### Corrosion protection

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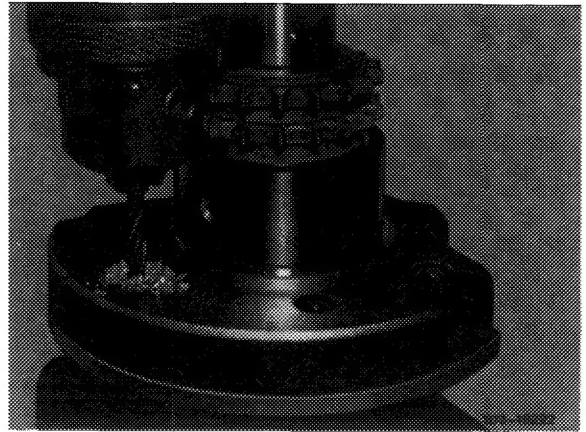
Crankshafts which are not immediately installed again should be lubricated with engine initial operation oil (SAE 30).

## Riveting additional weight off and on

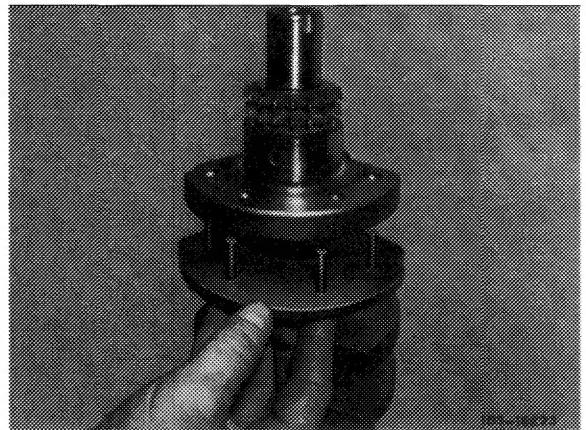
1 Punch mark countersunk rivet 6 x 28 mm accurately in center.



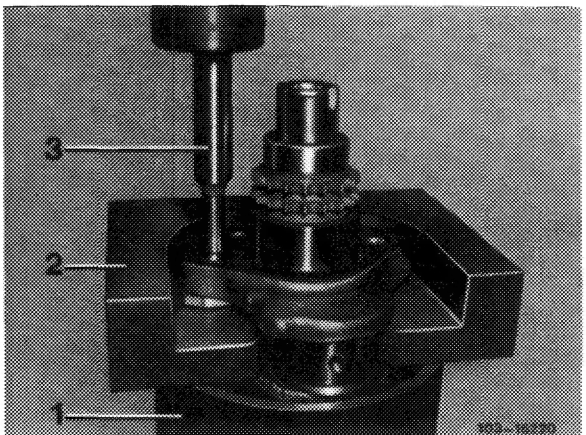
2 Drill into rivet heads with a 6.5 mm dia. drill and knock out.



3 Slip-on new or former, undamaged additional weight together with 4 countersunk rivets.



4 Introduce crankshaft into a suitable steel tube (approx. 165 mm dia. x 420 mm long) and place self-made rivet support (2) underneath.

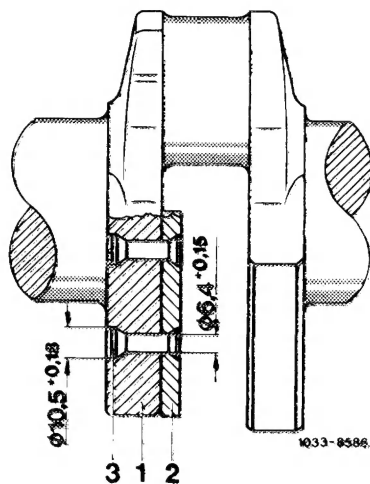


- 1 Steel tube 165 mm dia. x 420 mm long
- 2 Self-made rivet support
- 3 Snap die

5 Rivet countersunk rivet by means of a hydraulic press. The additional weight should then rest fully against crankshaft cheek without leaving any intermediate space.

6 Then check crankshaft for runout of bearing journals and balance together with balancing disc and flywheel, even if the former additional weight is used again.

- 1 Crankshaft
- 2 Additional weight 110 031 05 01
- 3 Countersunk rivet 6 x 28 mm DIN 661 MSt 34



#### Series production of riveted-on additional weight starting December 1978

starting engine end no.

starting chassis end no.

110.992 —10—038 031  
—12—062 390

116.020—112 253

110.923 —10—012 665  
—12—015 613

123.030—025 675  
123.050—002 801

110.932 —10—009 748  
—12—002 556

116.020—112 253

110.984 —10—014 634  
—12—051 160

123.033—050 600  
123.053—013 292

110.984 —10—014 634  
—12—051 160

123.093—001 229

110.985 —10—011 106  
—12—052 660

116.024/025—131 270

110.986 —10—002 276  
—12—005 142

107.022—006 288  
107.042—005 285